

Application No.: 10/700,512

Docket No.: 3095-009

Amendments to the Drawings:

Attached to this Amendment is new Figure 7.

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REMARKS

Reconsideration and allowance of the subject application in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 1-42 have been cancelled and new claims 43-73 have been added.

Claims 1-42 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The Office Action states that claims 1 and 19-22 references a set of figures for the structure, has periods in between sentences, and the various structural elements are not properly linked, but simply listed in a table.

In response, claims 1-42 have been cancelled and new claims 43-73 have been added. Claims 1 and 19-22 have been cancelled. Therefore, this objection should be withdrawn.

Claims 1-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lawhon et al. (U.S. 4,643,902, with evidence by Gobel et al. (U.S. 4,491,600). In response, claims 1-42 have been cancelled and replaced with new claims 43-73. Applicants believe new claims 43-73 are patentable over Lawhon et al. and Gobel et al. for the reasons discussed below.

The novel and non-obvious features of the present invention are summarized as follows:

- i) The device prevents degradation of temperature sensitive bioactive molecules by providing continuous and speedy removal of water from the aqueous plant extracts at ambient temperature,
- ii) the device obviates the problem of froth formation,
- iii) there is no major build up of osmotic pressure due to the absence of other inorganic solutes in the extracts,
- iv) the device has arrangements for automatic washing of membranes and thus minimizes the problems of membrane bio fouling,
- v) the device contains a spiral membrane module containing TFC membrane which removes water at ambient temperature and under pressure,

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- vi) the device contains solenoid valves, which are coupled with a backpressure regulator, which provide flow of extract solution, water and air during the concentration, wash and drain mode respectively.

The present invention is a novel and improved device for intended application of concentration of aqueous herbal extracts and is non-obvious and highly useful. The primary requirement of the device is that the solution after concentration should contain all the essential constituents therein and the same time it should not get wasted. This is important when aqueous herbal extracts are available in a small quantity for concentration.

In the present device complete process of "Concentrate", "Drain" and "Wash" mode occurs at room temperature and there is no risk of degradation of bio-active compounds. New Figure 7 is a flow diagram to represent the process of concentration using the device of the present invention.

After the concentration mode there is a considerable amount of concentrate remains with the membrane as hold up volume. This hold up volume contains plant constituents, salts and vital bioactive molecules. Hence it is important to extract all the important constituents from the concentrate. The present invention (an air compressor not shown in the figures) has an air blowing capacity of more than five cubic feet per minute (CFM) is provided. Air from the compressor is allowed to enter into the membrane module through filter. After completion of the concentration operation, the concentrate is pressurized by compressed air, which in turn pressurizes the membrane module and forces the hold up concentrate into an extract container.

The device is further provided with a cleaning system. The important part of any concentration device is a membrane and life of the membrane decides the life of the device. Life of the device could be defined is the time period for which the device performs its function of concentrating the aqueous herbal extract solution effectively. So it is mandatory to maintain the membrane in order to attain the effective concentration. The present device not only concentrates the aqueous herbal extract speedily and effectively but also maintains the membrane for its potency and life. As previously mentioned, the present device has three modes of operation namely "concentrate", "drain" and "wash" mode. The device of the present invention is provided with a touch screen control panel for controlling different modes of operation. The device is programmed in such a manner so that by selecting a particular mode with the help of the touch

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screen it selects particular solenoids from the series of solenoid valves and calculates the time for which it is to be powered. After the "Concentration mode", when the user selects the "Wash mode", the water from the reservoir is allowed to flow at a constant rate and prior to entering the membrane module it passes through the pressure pump and the filter. The water will carry along with it the adhering materials and sticky soluble materials. It is essential to clean the membrane surface thoroughly before starting the next concentrate mode. The waste water through the solenoid valve is disposed into the drain. Another vital feature of this device is that the problem of froth formation is totally alleviated.

The device of the present invention is suitable for speedier and effective concentration of herbal extract, while retaining all the important constituents and bio-active compounds in the concentrate.

Lawhon et al. discloses a process of ultra filtration (UF) to preferentially pass an filtration (UF) permeate containing flavour and aroma components while retaining spoilage micro organisms in a UF retentate. The UF retentate is then treated to inactivate a sufficient number of spoilage microorganisms of the juice under storage conditions. The UF permeate containing flavour and aroma components is then recombined with the UF retentate to provide fruit juice suitable for storage while avoiding the loss or alterations of the desirable flavour and aroma components of fresh juice.

In Lawhon et al., the UF retentate is treated by reverse osmosis (RO) to concentrate the flavour and aroma components in a RO retentate. The concentrated flavour and aroma components can then be recombined with the UF retentate to provide a juice suitable for storage or removed in the concentrated form for later dilution before use.

Lawhon et al. discloses a process which involves ultrafiltration and reverse osmosis. In the ultra filtration step the liquid is passed through a porous membrane containing pores sufficiently small in size to ensure retention of molecules of a certain minimum size and larger, while allowing molecules of a smaller size to pass through. In the reverse osmosis step a semipermeable membrane is employed which selectively allows passage of the solvent while retaining other components of the solution. A hydrostatic pressure is applied to the solution sufficient to overcome the osmotic pressure resulting from concentration differences on opposite sides of the semipermeable membrane. Therefore, due to reverse osmosis flavour and aroma components are concentrated before recombining them.

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Lawhon et al. does not provide any teachings for a device that provides speedier and effective concentration, avoids froth formation, and avoids fouling and deterioration of the RO membrane.

Gobel et al. discloses a process for concentrating aqueous solutions having temperature sensitive components. Gobel et al. uses (a) ultrafiltration for separating the permeate solution containing the majority of the temperature sensitive components, and the residual solution (b) freezing the permeate solution obtained in step (a) and removing the ice crystals formed thereby. In Gobel et al., the ultrafiltration means and the reverse osmosis means are integrated into the crystallizing cycle of the freeze concentrating phase. Accordingly the solution containing temperature sensitive components are separated in ultrafiltration means as well as the ice free solution leaving the crystallizer.

Gobel et al. describes advantage of using freeze drying along with the ultrafiltration of reverse osmosis. Gobel et al. broadly defines that the ultra filtration means can use modules like spiral, hollow, plate and pipe module. Gobel et al. also discloses that ultrafiltration means may also comprise reverse osmosis means. Gobel et al. broadly defines that the by experiment the optimal membrane type and the retention capacity can be determined.

However, Gobel et al. does not disclose specifically the membrane module using a particular membrane of specific dimensions (thickness, and length to diameter ratio) which will help in effective and speedier concentration.

Neither Lawhon et al. nor Gobel et al. provide any teachings in respect of the following features of the present invention:

- i. continuous and speedy removal of water from the aqueous plant extracts at ambient temperature thus preventing degradation of temperature sensitive bioactive molecules;
- ii. the device obviates the problem of froth formation
- iii. there is no major build up of osmotic pressure due to the absence of other inorganic solutes in the extracts
- iv. the device has arrangements for automatic washing of membranes and thus minimizes the problems of membrane bio fouling
- v. the device contains a spiral membrane module containing TFC membrane which removes water at ambient temperature and under pressure

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vi. the device contains solenoid valves, which are coupled with backpressure regulator, which provide flow of extract solution, water and air during the concentration, wash and drain mode respectively.

vii. The device provides automatic washing and concentration cycle.

Use of filtration and the reverse osmosis is known process. But the device of the present invention provides speedier and effective concentration of the aqueous herbal solution. It maintains all the active ingredients in the extracts in the concentrate. Its also avoid froth formation and fouling of the RO membrane. Accordingly, this rejection should be withdrawn.

All objections and rejections having been addressed, it is respectfully submitted that the present application should be in condition for allowance and a Notice to that effect is earnestly solicited.

To the extent necessary, a petition for an extension of time under 37 CFR 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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